National Aeronautics and
Space Administration
Goddard Space Flight Center
Greenbelt, MD 20771

SEP 27 1996

Reply to Attn of: 421

September 23, 1996

PL3095-I06011

Mr. Lee Tessmer
MODIS Program Manager
Santa Barbara Remote Sensing
75 Coromar Drive
Goleta, CA 93117

Disstribution
CDMO B32/79
Auchter B32/58
Clement B32/58
Durham B32/79
Graham B32/59

Dear Mr. Tessmer:

SBRS letters VJ50-0362, VJ50-0363, VJ50-0364 and VJ50-0365, all dated 10 July 1996, submitted for review CDRLs F306H-8, F306H-9, F306H-10 and F206H-11, respectively. These submittals provide Version Description Documents for the Startup PROMs. We have completed our review of these submittals. These submittals are acceptable.

SBRS letter VJ50-0011/005C, dated 2 August 1996, submitted for review CDRL 008C, Software Configuration Management Plan. This submittal changes the Software Configuration Management Plan to reflect new SBRS internal software configuration control practices. We have completed our review of this submittal. The following comments are noted:

a) The submittal makes repeated reference to Program Instructions 7.8 and 7.19. SBRS is requested to forward copies of these documents to the MODIS Technical Officer for information. This submittal is not required as a formal CDRL submittal. A letter or inclusion in the weekly technical memoranda is sufficient.

b) Section 4.2.2.2.3 indicates that implementation of Class II changes may occur prior to receiving concurrence of classification. GSFC notes that this involves SBRS proceeding at risk. We do not object to this procedure, but do note it involves some risk. Also, this section discusses approval of a contract modification to eliminate concurrence in Class II classification. There is not presently any such contract modification in process. If SBRS believes such a change is warranted, a recommendation should be made promptly.

SBRS letters VJ50-0292/003, VJ50-0294/003 and VJ50-0338/003, all dated 29 August 1996, submitted for review CDRLs F306H-3, F306H-4 and F306H-5, respectively. These submittals provide Rev C of the Version Description Documents for the Flight Format Processor Software (153803), Flight Control Processor Software (153804) and Common Flight Software (153904), respectively. We have completed our review of these submittals. These submittals are acceptable.

If you have any questions on this letter, please contact me at (301)-286-6845.

Sincerely,

Kenneth Anderson

Kenneth Anderson
MODIS Technical Officer

PROGRAM/PROJECT INSTRUCTIONS

HUGHES
SANTA BARBARA REMOTE SENSING

SUBJECT: CHANGE CONTROL PROCEDURES FOR FLIGHT AND STE SOFTWARE

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.8

PROGRAM/PROJECT NAME: MODIS **REVISION:** C

SUPERSEDES: Program/Project Instruction 7.8, Rev. B (dated 2/12/96)

AUTHORIZING DOCUMENT: SBRS Engineering Procedure 1.11, Program/Project Instructions

REFERENCE:

Configuration/Data Management Office (CDMO) Department Operating Instructions (DOI):

01 Software Configuration Management (CM) Procedure Overview
02 Software Identification
03 Software Configuration Control
04 Software CM Procedures, Standard/Routine
04.1 Software CM Change Control Procedures, Urgent/Emergency
05 Software Status Accounting
06 Software Reviews and Audits
07 Software Special Issues

Engineering Procedures (EP):

1.1 Drafting Room Practice
1.5 Checking of Engineering Drawings
2.1 Configuration Management Operating Plan, Requirements for
2.4 Configuration Management of Computer Programs
2.4.1 Configuration Management of Firmware
3.3 Engineering Specifications, Detail Requirements for
3.10 Control Drawings, Bookform
5.7 Computer Program Configuration Documentation for Status Accounting

Product Assurance (PA) DOIs:

013 Controlling and Processing Suspended Material
048 Software Programs, Media, and Documentation Control and Validation

MODIS Standards, Plans and Program/Project Instructions (PI):

NASA-STD-2100-91 NASA Software Documentation Standard, Software Engineering Program
CDRL 008C Software Configuration Management Plan
PI 5.12 Software Discrepancy Report Preparation
PI 7.3 Signature Authorization for Engineering Documentation, Software, AHRs/ABCTRs and Supplier Planning
PI 7.13 Controlling Red-lined Subassembly, Assembly, and System Level Test/Alignment Procedures
PI 7.19 Combination Change Form

PURPOSE: To summarize the requirements and associated procedures for MODIS flight and ground support System Test Equipment (STE) software configuration management.

APPLICABLE TO: All SBRC/SBRS personnel responsible for the development, evaluation, integration, and maintenance of software and firmware pertaining to software categories checked in form SB-1283A in this PI.

FORMS USED: SB-1283A Software CM Program Requirements Summary

SUBJECT: CHANGE CONTROL PROCEDURES FOR FLIGHT AND STE SOFTWARE

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.8

PROGRAM/PROJECT NAME: MODIS **REVISION:** C

FORMS USED: SB-1283A Software CM Program Requirements Summary (refer to CDMO DOI 01 for completion instructions)
Refer to CDMO DOI 04 for engineering change request forms
Refer to CDMO DOI 02 for software identification document forms completion instructions (FCI)

DEFINITION: Refer to the "Definition" section in CDMO DOI 01. Note that the "**Software Categories**" shown in form SB-1283A are defined in detail in DOI 01.

RESPONSIBILITY:

1. Refer to the "Responsibility" sections in CDMO DOIs 01, 03, 04, 04.1, 05, and 06.

INSTRUCTIONS:

2. In the completed form SB-1283A that follows, procedures associated with tasks for which an "**X**" is marked next to a given software category shall apply to this project. The procedures are subject to any tailoring identified later in this section.

   Copies of **supplemental documents** are available as follows:

   - CDRL 008 is available from CDMO.
   - EP manuals are available from Engineering Standards Administration.
   - CDMO DOIs are available in electronic form in the "**CDMO**" folder on the SBRC Novell file server. (The full path is AppleTalk Zone "SB SERVERS"/server "SBRC_INFO_ SYSTEMS" accessed as a **guest**/"MACVOL2"/"CDMO"folder.) Hard copies are also available from CDMO DOI manuals maintained by CDMO and control points in various departments outside of CDMO.
   - PA DOIs are available in electronic form from the file server. (The full path is AppleTalk Zone "SB-B03/file server "SBRC_QA_ACCESS" accessed as a **guest**/"Policies & Practices (g)"/ "QA DOI's.") Hard copies are also available from PA DOI manuals maintained by PA control points in each building.

APPROVED: _____
Lee Tessmer
MODIS Program Manager

APPROVED: _____
A. Napolitano***
General Manager, Civil Space Programs

*** This PI deviates from EP 2.4, "Configuration Management of Computer Programs," paragraph 4.3, in that it permits in certain special cases only one (1) instead of two (2) software baseline master media copies to be impounded in EDCC. (Refer to Note 3 of this PI.) This PI also deviates from EPs 1.1, 1.2, 4.4, 4.7, and 4.10 where it discusses the Engineering Change form.

PROGRAM/PROJECT INSTRUCTIONS

HUGHES
SANTA BARBARA REMOTE SENSING

SUBJECT: CHANGE CONTROL PROCEDURES FOR FLIGHT AND STE SOFTWARE

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.8

PROGRAM/PROJECT NAME: MODIS **REVISION:** C

Software Configuration Management Program Requirements Summary Form SB-1283A

☐ Check here if this is a preliminary version of SB-1283A for this project			Date: *6/29/96*				
Program/Project Name: *MODIS* PL No: *3095*			Customer: *NASA/GSFC*				
Control Item Numbers & Names [See DMS for current Control Item listing] *Refer to MODIS Master Index (MI405000)*			Contact Names & Extensions: *Various; see MODIS PI 7.3, Attach. H*				
			Project Location: *Goleta*				
Control Items(s) are Flight Equip: X Test Equip: X Other: _____			SOFTWARE CATEGORIES (See legend)				
			MC	PUC	PDC	PS	REMARKS, NOTES
A) PROPOSED SOFTWARE	1.SOFTWARE (SW) CSCIs	a. Est. SW CSCIs per category	X	X	X		*Refer to NOTE 1 and CDRL 008C*
	2.FIRMWARE (FW) CSCIs	a. Est. FW CSCIs per category					
B) SOFTWARE STANDARDS	1.DEVEL./EVALUATION	a. DOD-STD-2167A/2168					
		b. NASA-STD-2100-91	X	X			
		c. Other:					
	2.CONFIGURATION MGMT	a. MIL-STD-973					
		b. MIL-STD-480/483/1521	X	X	X		*480B/483A/1521B*
		c. Other:					
C) SOFTWARE PLANS	1. DELIVERABLE PLANS	a. SW Management/Devel. Plan	X	X	X		*Refer to CDRL 008*
	2. INTERNAL PLANS	a. Project Instruct.- EP 1.11, 2.1	X	X	X		CDMO DOI 01
		b. Other:					
D) SOFTWARE BASELINES	1. CUSTOMER	a. Functional/Allocated/Product	X	X	X		*Refer to CDRL 008C*
		b. Other:					
	2. SBRC	a. Post-Validation					
		b. Other:					
E) SOFTWARE IDENTIFICATION	1. DELIV. DOCUMENTS CDRLs: _____	a. Requirements/Design Docmts	X	X			*Refer to CDRL 008C Table 4-1 & CDRL list*
		b. SW - VDD *(NASA-DID-P500)*		X	X		CDMO DOI 02 Suppl. B *CDRL 306H*
		c. FW - AID - EP 2.4.1, 3.10	X		X		CDMO DOI 02 Suppl. F *(NOTE: V DD appendix must be Suppl. B format)*
		d. SW Syst. Desc. (SSD) - EP 5.7					
		e. Other: *Document checking*	X	X	X		*Refer to NOTE 2*
	2.INTERNAL DOCUMENTS	a. SW - VDD per EP 5.7					
		b. FW - AID - EP 2.4.1, 3.10					
		c. SW Syst. Desc. (SSD) - EP 5.7	X	X	X		CDMO DOI 02 Suppl. D *only as needed*
		d. Other:					

Legend: **MC** = Mission Critical **PUC** = Prod. Use Critical (e.g., acceptance test sw) **PDC** = Prod. Devel. Critical (e.g., misc. test sw) = Prod. Support (e.g., mfg sw) PTE = Product Test Engineer DMS = Design Management System LOI = Lab Operating Instruct.

PROGRAM/PROJECT INSTRUCTIONS

HUGHES
SANTA BARBARA REMOTE SENSING

SUBJECT: CHANGE CONTROL PROCEDURES FOR FLIGHT AND STE SOFTWARE

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.8

PROGRAM/PROJECT NAME: MODIS **REVISION:** C

Software Configuration Management Program Requirements Summary Form SB-1283A

☐ Check here if this is a preliminary version of SB-1283A for this project			Date: *6/29/96*				
Program/Project Name: *MODIS* PL No: *3095*			Customer: *NASA/GSFC*				
Control Item Numbers & Names [See DMS for current Control Item listing] *Refer to MODIS Master Index (MI405000)*			Contact Names & Extensions: *Various; see MODIS PI 7.3, Attach. H*				
			Project Location: *Goleta*				
Control Items(s) are Flight Equip: X Test Equip: X Other: _____			SOFTWARE CATEGORIES (See legend)				
			MC	PUC	PDC	PS	REMARKS, NOTES
A) PROPOSED SOFTWARE	1.SOFTWARE (SW) CSCIs	a. Est. SW CSCIs per category	X	X	X		*Refer to NOTE 1 and CDRL 008C*
	2.FIRMWARE (FW) CSCIs	a. Est. FW CSCIs per category					
B) SOFTWARE STANDARDS	1.DEVEL./EVALUATION	a. DOD-STD-2167A/2168					
		b. NASA-STD-2100-91	X	X			
		c. Other:					
	2.CONFIGURATION MGMT	a. MIL-STD-973					
		b. MIL-STD-480/483/1521	X	X	X		*480B/483A/1521B*
		c. Other:					
C) SOFTWARE PLANS	1. DELIVERABLE PLANS	a. SW Management/Devel. Plan	X	X	X		*Refer to CDRL 008*
	2. INTERNAL PLANS	a. Project Instruct.- EP 1.11, 2.1	X	X	X		CDMO DOI 01
		b. Other:					
D) SOFTWARE BASELINES	1. CUSTOMER	a. Functional/Allocated/Product	X	X	X		*Refer to CDRL 008C*
		b. Other:					
	2. SBRC	a. Post-Validation					
		b. Other:					
E) SOFTWARE IDENTIFICATION	1. DELIV. DOCUMENTS CDRLs: _____	a. Requirements/Design Docmts	X	X			*Refer to CDRL 008C Table 4-1 & CDRL list*
		b. SW - VDD *(NASA-DID-P500)*		X	X		CDMO DOI 02 Suppl. B *CDRL 306H*
		c. FW - AID - EP 2.4.1, 3.10	X		X		CDMO DOI 02 Suppl. F *(NOTE: V DD appendix must be Suppl. B format)*
		d. SW Syst. Desc. (SSD) - EP 5.7					
		e. Other: *Document checking*	X	X	X		*Refer to NOTE 2*
	2.INTERNAL DOCUMENTS	a. SW - VDD per EP 5.7					
		b. FW - AID - EP 2.4.1, 3.10					
		c. SW Syst. Desc. (SSD) - EP 5.7	X	X	X		CDMO DOI 02 Suppl. D *only as needed*
		d. Other:					

Legend: **MC** = Mission Critical **PUC** = Prod. Use Critical (e.g., acceptance test sw) **PDC** = Prod. Devel. Critical (e.g., misc. test sw) = Prod. Support (e.g., mfg sw) PTE = Product Test Engineer DMS = Design Management System LOI = Lab Operating Instruct.

PROGRAM/PROJECT INSTRUCTIONS

HUGHES
SANTA BARBARA REMOTE SENSING

SUBJECT: CHANGE CONTROL PROCEDURES FOR FLIGHT AND STE SOFTWARE

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.8

PROGRAM/PROJECT NAME: MODIS **REVISION:** C

			MC	PUC	PDC	PS	REMARKS, NOTES
F) LIFE CYCLE SOFTWARE CONTROL	1. DEVELOPMENT	a. SW Development Files/Folders	X	X			Instrumentation LOIs
		b. SW Development Library					
		c. Incremental Docmt. Promotion	X	X			*Refer to CDRL 008C*
		d. Software Review Board (SRB)	X	X			CDMO DOI 03 Sect. E; *Refer to CDRL 008C*
		e. Other:					
	2. VALIDATION	a. SW Design/Code Walk-through	X	X			Instrumentation LOIs, Prod. Assur. (PA) DOIs
		b. SW Test Evaluation/Prove-in	X	X			PA DOI 048
		c. SW Discrepancy Reporting	X	X			*Refer to PI 5.12*
		d. Other:					
	3. POST-RELEASE CHANGE CONTROL	a. Formal - ECPs/NORs/SCNs	X	X	X		*Refer to CDRL 008C*
		b. Class II Change Concurrence	X	X	X		*Refer to NOTE 6*
		c. Routine SW Change Controls	X	X	X		*Refer to NOTE 7*
		d. Urgent/Emergency Changes	X	X	X		CDMO DOI 04.1, *NOTE 4*
		e. Other:					
	3.1 SW REPOSITORY - Primary -	a. On-line Directory or File Server	X	X	X		*Refer to NOTE 4*
		b. CDMO/EDCC Custody - EP 2.4	X	X	X		*Refer to NOTE 3*
		c. Other:					
	3.2 SW REPOSITORY - Disaster Recovery -	a. On-line Directory or File Server					
		b. CDMO/EDCC Custody - EP 2.4	X	X	X		*Off-site storage-TBD*
		c. Other:					
G) STATUS ACCOUNTING	1. STATUS ACCOUNTING METHODS	a. DMS (EDIC/EBOM)	X	X	X		*Refer to CDRL 008C*, CDMO DOI 04, 04.1, 05
		b. Other:					
H) REVIEWS & AUDITS	1. REVIEWS	a. SSR/PDR/CDR/TRR	X	X	X		*Refer to CDRL 008C*
	2. AUDITS	a. FCA/PCA	X	X	X		*Refer to CDRL 008C*
		b. Other: *SW Accept. Review*	X	X	X		*Refer to CDRL 008C*
I) SPECIAL ISSUES	1. SPECIFIC GUIDANCE AND INFORMATION	a. Firmware and Similar Devices	X				*Refer to CDMO DOI 07 Sect. A; NOTE 5*
		b. On-line Software Repositories					Sect. B
		c. SW Media Disaster Recovery					Sect. C
		d. Static and Dynamic Files					Sect. D
		e. Off-site/Off-hours Changes	X	X	X		*See NOTE 4; PI 7.13, PI 7.19*
		f. Classified SW Procedures					Sect. F
		g. Subcontractor Controls	X	X	X		*Refer to CDRL 008C*
		h. Manufacturing Software					Sect. H
		i. Machine Readable CI (MRCI)					Sect. I

Legend: **MC** = Mission Critical **PUC** = Prod. Use Critical (e.g., acceptance test sw) **PDC** = Prod. Devel. Critical (e.g., misc. test sw) **PS** = Prod. Support (e.g., mfg sw) PTE = Product Test Engineer DMS = Design Management System LOI = Lab Operating Instruct.

CONFIG MGMT. A. Sommers PROD ASSUR. PTE: JC Trautwein PROG MGR.

PROGRAM/PROJECT INSTRUCTIONS

HUGHES
SANTA BARBARA REMOTE SENSING

SUBJECT: CHANGE CONTROL PROCEDURES FOR FLIGHT AND STE SOFTWARE

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.8

PROGRAM/PROJECT NAME: MODIS **REVISION:** C

			MC	PUC	PDC	PS	REMARKS, NOTES
F) LIFE CYCLE SOFTWARE CONTROL	1. DEVELOPMENT	a. SW Development Files/Folders	X	X			Instrumentation LOIs
		b. SW Development Library					
		c. Incremental Docmt. Promotion	X	X			*Refer to CDRL 008C*
		d. Software Review Board (SRB)	X	X			CDMO DOI 03 Sect. E; *Refer to CDRL 008C*
		e. Other:					
	2. VALIDATION	a. SW Design/Code Walk-through	X	X			Instrumentation LOIs, Prod. Assur. (PA) DOIs
		b. SW Test Evaluation/Prove-in	X	X			PA DOI 048
		c. SW Discrepancy Reporting	X	X			*Refer to PI 5.12*
		d. Other:					
	3. POST-RELEASE CHANGE CONTROL	a. Formal - ECPs/NORs/SCNs	X	X	X		*Refer to CDRL 008C*
		b. Class II Change Concurrence	X	X	X		*Refer to NOTE 6*
		c. Routine SW Change Controls	X	X	X		*Refer to NOTE 7*
		d. Urgent/Emergency Changes	X	X	X		CDMO DOI 04.1, *NOTE 4*
		e. Other:					
	3.1 SW REPOSITORY - Primary -	a. On-line Directory or File Server	X	X	X		*Refer to NOTE 4*
		b. CDMO/EDCC Custody - EP 2.4	X	X	X		*Refer to NOTE 3*
		c. Other:					
	3.2 SW REPOSITORY - Disaster Recovery -	a. On-line Directory or File Server					
		b. CDMO/EDCC Custody - EP 2.4	X	X	X		*Off-site storage-TBD*
		c. Other:					
G) STATUS ACCOUNTING	1. STATUS ACCOUNTING METHODS	a. DMS (EDIC/EBOM)	X	X	X		*Refer to CDRL 008C*, CDMO DOI 04, 04.1, 05
		b. Other:					
H) REVIEWS & AUDITS	1. REVIEWS	a. SSR/PDR/CDR/TRR	X	X	X		*Refer to CDRL 008C*
	2. AUDITS	a. FCA/PCA	X	X	X		*Refer to CDRL 008C*
		b. Other: *SW Accept. Review*	X	X	X		*Refer to CDRL 008C*
I) SPECIAL ISSUES	1. SPECIFIC GUIDANCE AND INFORMATION	a. Firmware and Similar Devices	X				*Refer to CDMO DOI 07 Sect. A; NOTE 5*
		b. On-line Software Repositories					Sect. B
		c. SW Media Disaster Recovery					Sect. C
		d. Static and Dynamic Files					Sect. D
		e. Off-site/Off-hours Changes	X	X	X		*See NOTE 4; PI 7.13, PI 7.19*
		f. Classified SW Procedures					Sect. F
		g. Subcontractor Controls	X	X	X		*Refer to CDRL 008C*
		h. Manufacturing Software					Sect. H
		i. Machine Readable CI (MRCI)					Sect. I

Legend: **MC** = Mission Critical **PUC** = Prod. Use Critical (e.g., acceptance test sw) **PDC** = Prod. Devel. Critical (e.g., misc. test sw) **PS** = Prod. Support (e.g., mfg sw) PTE = Product Test Engineer DMS = Design Management System LOI = Lab Operating Instruct.

CONFIG MGMT. A. Sommers PROD ASSUR. PTE: JC Trautwein PROG MGR.

SUBJECT: CHANGE CONTROL PROCEDURES FOR FLIGHT AND STE SOFTWARE

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.8

PROGRAM/PROJECT NAME: MODIS **REVISION:** C

NOTE 1: Flight and STE Computer Software Configuration Items (CSCIs) by software category (refer to CDRL 008C):

Flight CSCIs	MC	PUC	PDC
1. SW Development Environment			X
2. Control Processor and Format Processor	X		
(GSE) STE CSCIs:			
1. Payload Interface Controller Host Software			X
2. SW Development and Configuration Environment			X
3. Commercial Off-The-Shelf (COTS) Software			X
4. All other test controller software CSCIs		X	

NOTE 2: Document Checking

Software specifications (the CDRL 306- and 415-series documents found in Table 4-1 of CDRL 008C) shall undergo a **"specified characteristics check"** in accordance with EP 1.5 (as stated in CDRL 008C). It is assumed that the REA's signature on a document serves as a verification of the technical content. Formal customer correspondence regarding the adequacy of document format and content may serve as evidence that specific characteristics have been reviewed in sufficient detail as to make further checking unnecessary.

Where inconsistencies are found requiring correction of documentation, but correction prior to document release would require resubmitting documents for customer approval, a combined Engineering Change (EC) form per PI 7.19 may be used to record the problems for correction at a later date. (Use of the older SECR and RN forms is acceptable if more convenient, but should be phased out.)

MINIMAL CHECK: When documents have been checked once for the characteristics listed below, a more cursory check of future revisions may be performed. A cursory check may entail a review of changed sections and/or the items listed on the CDMO administrative checklist. Simple VDDs or AIDs may use a minimal check from their inception.

The following characteristics are subject to checking unless otherwise indicated:

1) **Paragraph structure per NASA-STD-2100-91:**
   a. Document paragraph sequence
   b. Paragraph titles
   c. DID references
   d. Table of Contents correlation
2) **Paragraph referencing** (e.g., ensuring that cross-references are consistent)
3) **Document referencing** (e.g., ensuring that cross-references are consistent)
4) **Figure and table referencing** (e.g., ensuring that labels and cross-references are consistent)
5) **Document number per EP 1.1**

   Document number on cover sheet should match document number in the footer.

SUBJECT: CHANGE CONTROL PROCEDURES FOR FLIGHT AND STE SOFTWARE

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.8

PROGRAM/PROJECT NAME: MODIS **REVISION:** C

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Flight CSCIs	MC	PUC	PDC
1. SW Development Environment			X
2. Control Processor and Format Processor	X		
(GSE) STE CSCIs:			
1. Payload Interface Controller Host Software			X
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NOTE 2: Document Checking

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Where inconsistencies are found requiring correction of documentation, but correction prior to document release would require resubmitting documents for customer approval, a combined Engineering Change (EC) form per PI 7.19 may be used to record the problems for correction at a later date. (Use of the older SECR and RN forms is acceptable if more convenient, but should be phased out.)

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4) **Figure and table referencing** (e.g., ensuring that labels and cross-references are consistent)
5) **Document number per EP 1.1**

   Document number on cover sheet should match document number in the footer.

6) Document title per EP 3.3

Document title on cover sheet should correspond to document title as found in the body of the document.

7) Document page numbering

The total page count on the document cover sheet shall reflect the total number of pages, including tables of contents, appendices, etc. contained in the document. The document's sections need not contain sequentially numbered pages beginning with page 1.

8) Form and format per EP 3.3

Document footers shall include, as a minimum, the following information (and may also include the CDRL number):

SBRC CAGE code Document number Revision Sheet No.

9) Contract Number

The MODIS contract number (NAS5-30800) shall appear on the cover sheet of each document.

10) Signatures

Signature authority is established per the applicable section of MODIS PI 7.3.

11) Legibility

Documents shall undergo a cursory legibility check to ensure that all pages are clear and reproducible.

12) Data base and/or electronic file address information

The document cover sheet should contain a notation below the document border regarding where Computer Traceability Record (CTR) data is found (e.g., "See DMS").

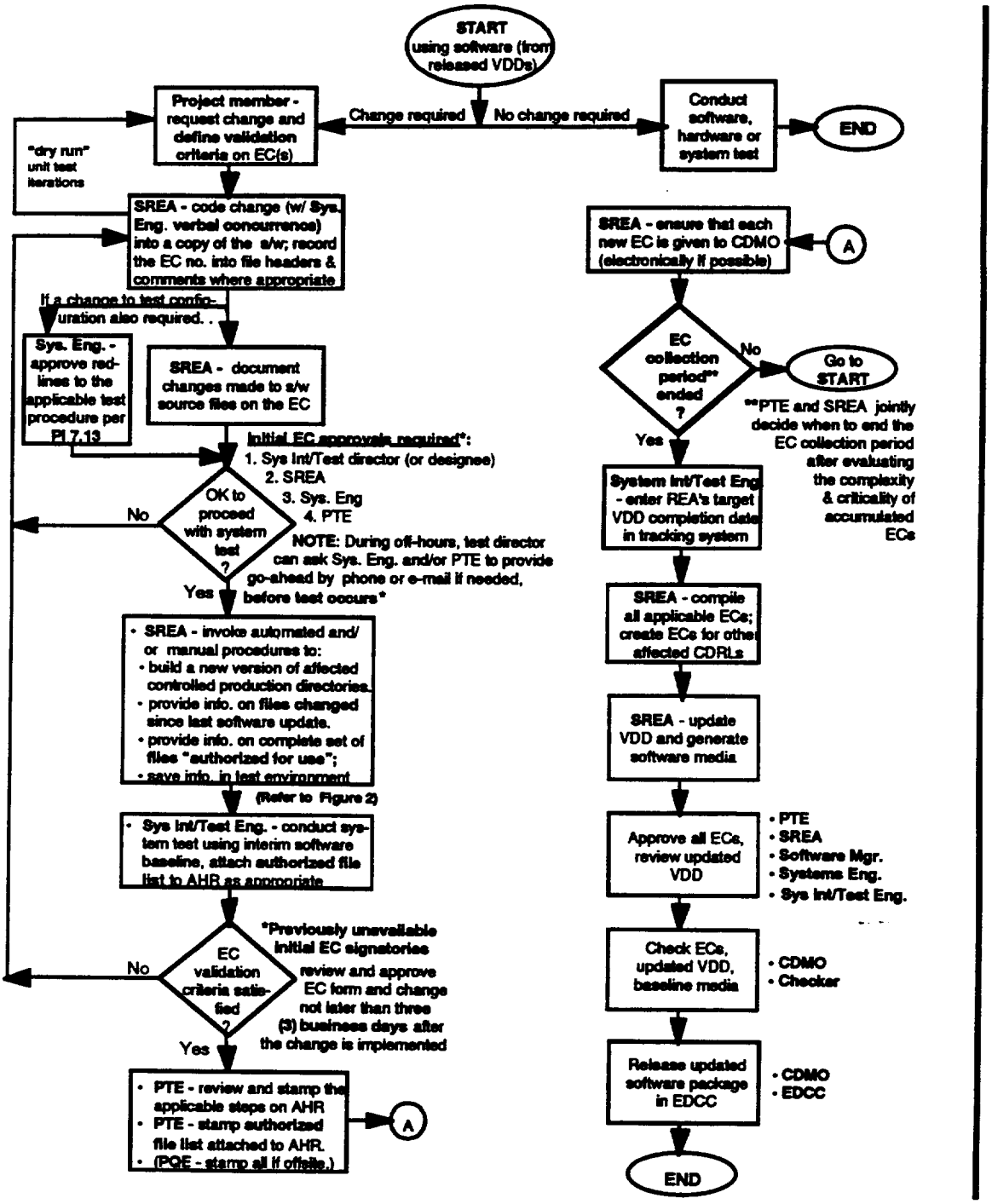
NOTE 3: Commercial-Off-The-Shelf (COTS) software baseline master media:

Licensing agreements and other conditions may restrict the duplication of commercial software used in the development environment for MODIS software. In these instances, only the number of media copies allowed by the licensing agreement or other conditions shall be required to be stored as baseline master media in EDCC. This means that in certain cases there will be only one (1) instead of two (2) baseline master media copies submitted to EDCC along with a VDD.

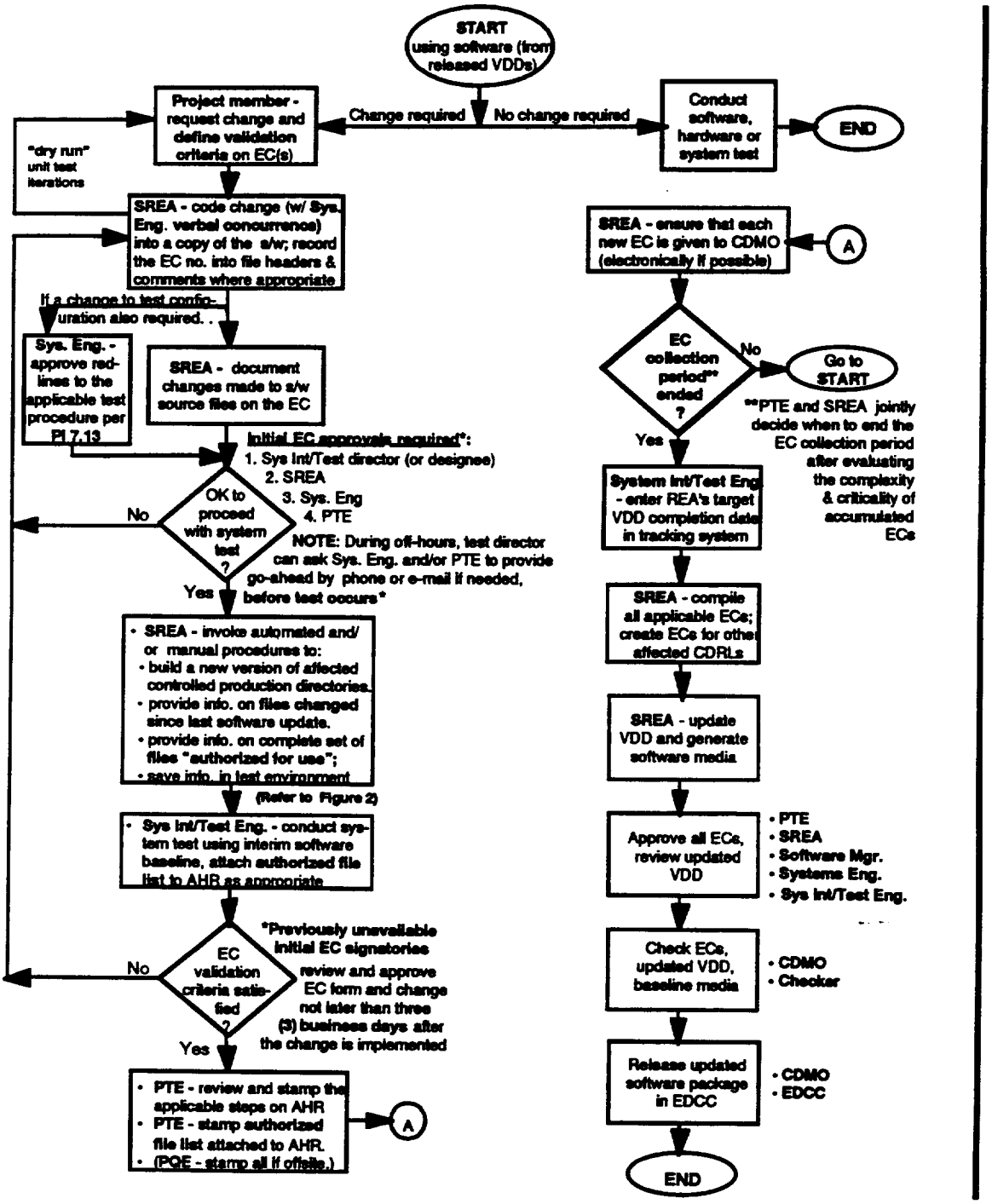
NOTE 4: **Off-site/off-hours/high-rate change procedure for Flight and STE software:** Figure 1 and the table below identify requirements for off-site/off-hours/high-rate changes. The master software baseline resides on-line. Engineering Change (EC) forms apply per PI 7.19. (Use of the older SECR and RN forms is acceptable if more convenient, but should be phased out.)

Applicable to:	• **STE and Flight software (except Flight start-up code)**
Not applicable to:	• **Test command procedures (see PI 7.9); start up code**
When to use:	• This procedure is intended for use during high-rate change software activity, e.g., during integration or similar testing periods. This procedure is acceptable under any conditions that would otherwise result in an undesirable schedule delay. • In contrast, the urgent change procedure described in CDMO DOI 04.1 is used for low-rate urgent change conditions.
Unique features and steps:	1. The SREA documents each change on an EC form. Changes may be fully implemented and verified using the EC(s) alone. Each change must be verified and *initially* approved against its EC(s) before use in hardware testing, as shown in Figure 1. During off-hours, the Syst. Int. & Test director (or authorized designee) and SREA obtain verbal go-ahead from Syst. Eng. and/or PTE, if needed. 2. The SREA generates an interim software baseline from one or more *initially* approved ECs. Each interim baseline resides on-line in a controlled workstation environment and is associated with its applicable EC(s). A VDD update and new baseline master media are not required for each *interim* baseline. 3. The PTE reviews and approves the following information (made available by the SREA for each interim baseline): a. all files currently authorized for use (attached to AHR) b. files that have changed since the last software update 4. Completion of *initial* EC approvals should occur not later than three (3) business days following change implementation. 5. An unlimited number of ECs (and interim baselines) may collect until the SREA and PTE jointly decide, based on the complexity and criticality of accumulated ECs, to update the VDD. 6. System Integration & Test schedules and tracks the close-out of outstanding updates to VDDs as indicated in Step 5, above (for all software formally managed by System Integration & Test).
Special terms and conditions:	• Red-lines to MODIS system, subsystem, or software test procedures are authorized by PI 7.13. Red-lined data masters are approved and monitored by the PTE. Incorporation of red-lines occurs per NOTE 7 within a period determined jointly by the PTE and SREA. • Test configuration changes (needing test procedure redlines) affect: a. Flight hardware and STE arrangement b. Hardware operating mode and redundancies selected c. Data to be acquired

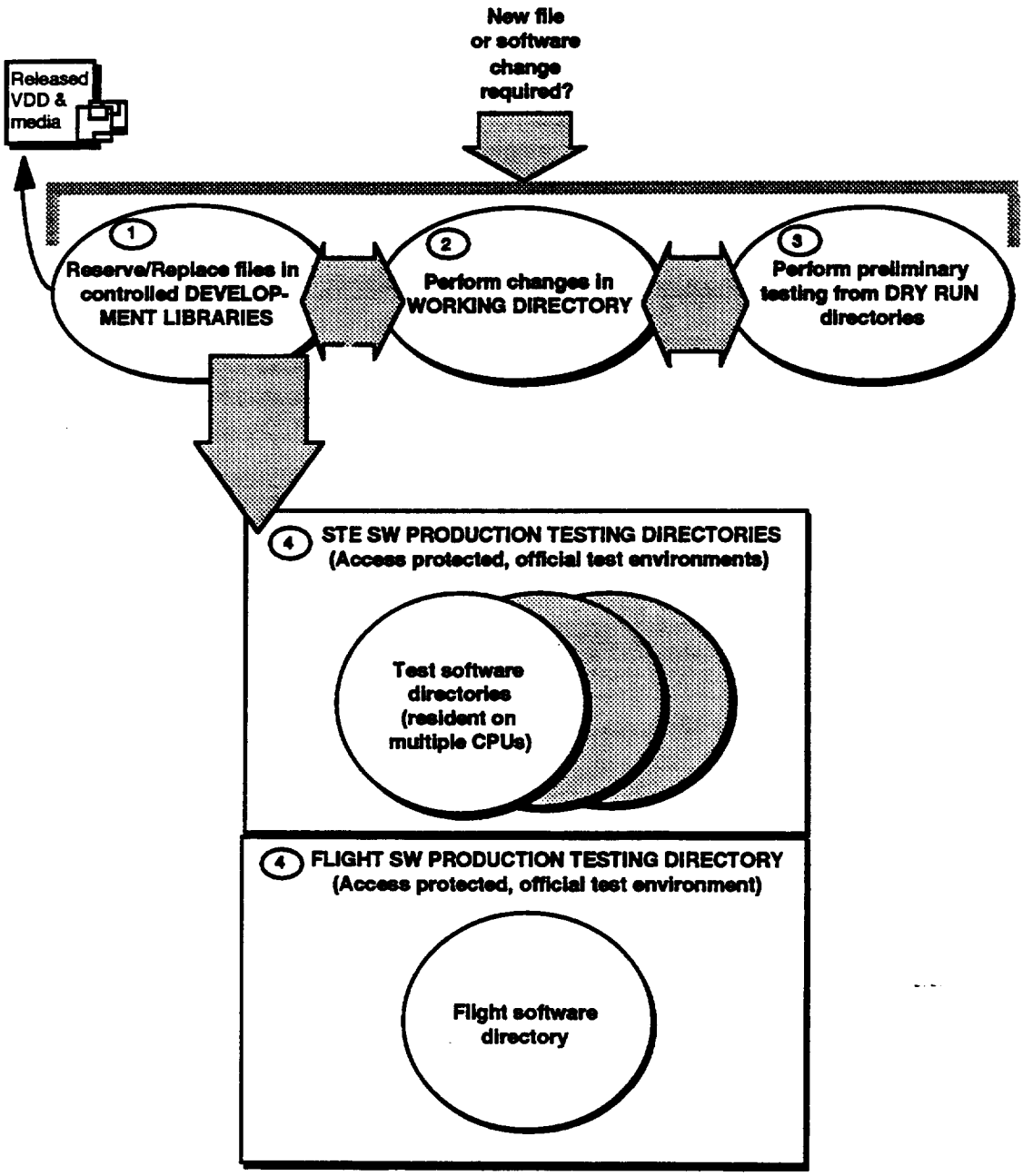
NOTE 4, continued:



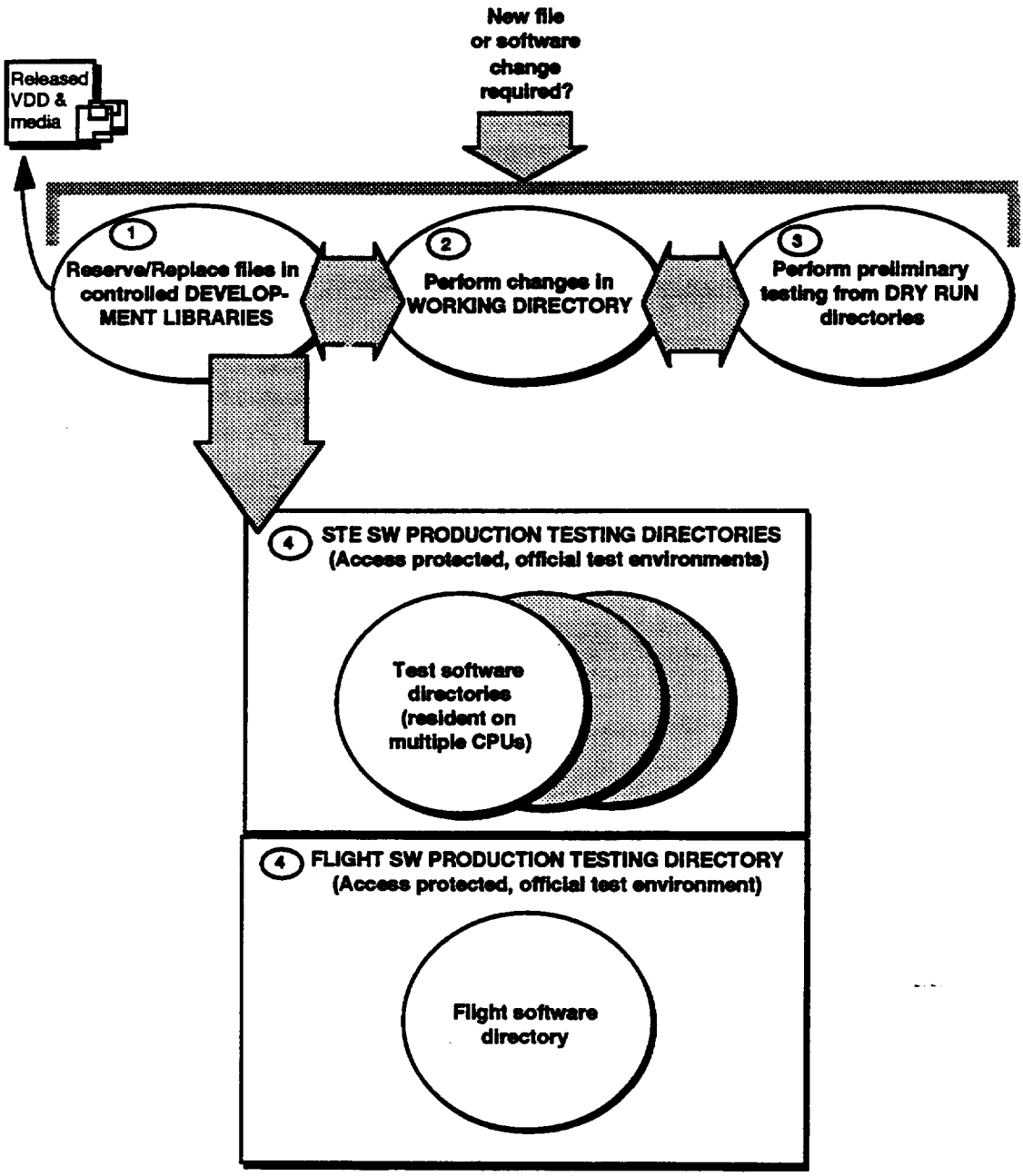
NOTE 4, continued:



NOTE 4, continued:



NOTE 4, continued:



NOTE 5: Incorporation and verification of Flight software changes:

Step 1: Design Engineering (one time only)

Revise the MODIS CCA assembly drawings with a NOTE indicating that programming will occur following CCA testing using the VDDs indicated below:

Software for programming -->	MODIS circuit card assemblies
• 153803 - VDD, Format Processor	• 404848 Formatter Assembly
• 153804 - VDD, Control Processor	• 404871-1, -2 Telemetry & Command Processor

NOTE Example: "Following testing, program CCA per VDD 153803"

Step 2: Manufacturing Engineering (one time only)

- Add a new operation to the AHR (the CCA programming step per the applicable VDD in Step 1)
- Revise ABCTR record for each affected CCA to include the VDD description, no., & revision.*

*VDD will not correspond to a Parts List line item.

Step 3: Complete the following actions as indicated. (when changes occur)

Step 3a: Software REA/SREB/CDMO

- Perform the Flight software change using the applicable procedure:

For this situation . . .	use this procedure:
• Routine change	CDMO DOI 04
• Urgent/emergency change	CDMO DOI 04.1
• High-rate change	NOTE 4 of this PI

- Enter the VDD, software document change information into **DMS.**
- **Notify** H/W CM and Manufacturing when the change is released.

Step 3b: CDMO (h/w)

- Update **as-designed** parts list data base to reflect new **VDD rev.**

Step 3c: Manufacturing Engineering

- Update **ABCTR/AHR** to reflect **VDD rev.** used for programming.

Step 4: Product Assurance/CDMO

Perform **as-designed/as-built** reconciliation prior to the **Consent-To-Integrate** review.

NOTE 5: Incorporation and verification of Flight software changes:

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Step 4: Product Assurance/CDMO

Perform **as-designed/as-built** reconciliation prior to the **Consent-To-Integrate** review.

NOTE 6: Class II change classification concurrence

As stated in CDRL 008C, engineering changes not classified as Class I are classified as Class II. Class II changes will be submitted to NASA/GSFC for concurrence in classification; however, change implementation may begin prior to receipt of customer concurrence. Upon approval of a contract modification to eliminate concurrence in classification, the practice of submitting Class II software changes for concurrence will discontinue.

NOTE 7: Routine software change controls

Routine software change controls may now be performed as follows:

a. Change bars or other annotations in the document indicate where changes occurred. (NOTE: Alternatively, change information can continue to be documented using a change form, whether or not document annotations are used. Annotations inside a document will *eliminate* the need to list the changes in detail using a change form, however.)

IF this condition exists . . .	. . . THEN consider this type of annotation:
• Microsoft Word© document (other than a VDD or AID)	• Change bars within the document, and/or an appendix containing electronic red-lines, descriptions, or a summary of what has changed.
• Microsoft Word© VDD or AID	• Change bars within the document where applicable, and a description (in the body or in an appendix) of any software code changes made.
• TeamWork© or Interleaf© document	• An add-on appendix created in MS Word© that contains change information.

b. A single-page combined Engineering Change (EC) form per PI 7.19, as a minimum, is used to capture the approvals for the updated, annotated document. (Use of the older SECR and RN forms is acceptable if more convenient, but should be phased out.)

If the reason for change is *not* indicated as part of the document annotations, the EC states the reason for change as well. For example, the EC can state:

> "Reason and Description of Change: This change incorporates red-lines generated during SWAR testing. Refer to the annotations inside the document to determine the nature of the changes."

When the EC form is used in any manner other than that explained above, refer to PI 7.19 for instructions.

c. The updated document and EC form(s) shall be routed for SRB approval and EDCC release.

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IF this condition exists . . .	. . . THEN consider this type of annotation:
• Microsoft Word© document (other than a VDD or AID)	• Change bars within the document, and/or an appendix containing electronic red-lines, descriptions, or a summary of what has changed.
• Microsoft Word© VDD or AID	• Change bars within the document where applicable, and a description (in the body or in an appendix) of any software code changes made.
• TeamWork© or Interleaf© document	• An add-on appendix created in MS Word© that contains change information.

b. A single-page combined Engineering Change (EC) form per PI 7.19, as a minimum, is used to capture the approvals for the updated, annotated document. (Use of the older SECR and RN forms is acceptable if more convenient, but should be phased out.)

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PROGRAM/PROJECT INSTRUCTIONS

HUGHES
SANTA BARBARA REMOTE SENSING

SUBJECT: ENGINEERING CHANGE PROCESS

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.19

PROGRAM/PROJECT NAME: MODIS **REVISION:**—

SUPERSEDES: N/A

AUTHORIZING DOCUMENT: SBRS Engineering Procedure 1.11, Program/Project Instructions

REFERENCE: EP 4.5 Engineering Change Effectivity Requirements

PURPOSE: This PI provides the instructions for processing hardware or software Engineering Change Request's/Engineering Order's/Revision Notice's on a single form.

NOTE: USE OF THIS FORM IS PREFERRED AND HIGHLY RECOMMENDED FOR REQUESTING ALL ENGINEERING CHANGES. USING THIS FORM ELIMINATES THE REQUIREMENT FOR RECORDING AND PROCESSING THE CHANGE ON MORE THAN ONE FORM.

APPLICABLE TO: All MODIS team personnel processing engineering changes.

FORMS USED: SBRS Engineering Change SB1757, See Figure 1
SBRS Engineering Change Continuation Sheet, SB1757A, See Figure 2

Electronic forms in Microsoft Word® 6.0, Filemaker® 2.1, and MacDraw Pro® are available. Electronic forms generated in other applications are acceptable provided they contain all the same information in the same locations as the controlled version. Borders and check boxes are optional.

1. Engineering Change Usage and Limitations

1.1 An Engineering Change (EC) is a single form used to identify and document change to an engineering document (or database). It is initiated to propose a change (ECR). The approved, released form may serve either as an advance change (EO) or to document an incorporated change (RN). Specific uses are as follows:

a. Authorize a direct incorporation
b. Change, delete, or add information to a released engineering document in lieu of making a direct incorporation.
c. Supersede or cancel an outstanding Engineering Order.
d. Provide revision history of the engineering document after the Revision Authorization has been incorporated into the document.

PROGRAM/PROJECT INSTRUCTIONS

HUGHES
SANTA BARBARA REMOTE SENSING

SUBJECT: ENGINEERING CHANGE PROCESS

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.19

PROGRAM/PROJECT NAME: MODIS **REVISION:**—

SUPERSEDES: N/A

AUTHORIZING DOCUMENT: SBRS Engineering Procedure 1.11, Program/Project Instructions

REFERENCE: EP 4.5 Engineering Change Effectivity Requirements

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c. Supersede or cancel an outstanding Engineering Order.
d. Provide revision history of the engineering document after the Revision Authorization has been incorporated into the document.

1.2 The REA's signature on an Engineering Change authorizes the preparation of either a direct incorporation package or an Engineering Order. An REA-approved EC may be presented to EDCC as authorization to release a document master for change incorporation. The Program Manager signature, or that of his/her designee, is required for release of a EO or direct incorporation. Other signature requirements are defined by the Program.

1.3 An Engineering Change contains instructions for revising one engineering document or multiple engineering documents with the same changes.

1.4 When multiple engineering documents with the same changes are identified, a single change form may be used at the discretion of the Configuration Management Administrator.

1.5 When completed, each Engineering Change contains all required information and approvals for the incorporation of the proposed change into the original document.

1.6 When more than one page is required to describe the change completely, an Engineering Change Continuation Sheet is used.

1.7 A released Engineering Order cannot be altered (except to enter a revision letter into the "Incorporating Rev" block. It may be canceled, canceled and superseded, or corrected by initiating another Engineering Change and preparing the appropriate canceling EO, canceling and superseding EO, or correcting EO.

1.7.1 When all the information on an outstanding Engineering Order is to be canceled and not superseded, the note "This EO cancels EO ___" is entered in the "Reason for and Description of Change" block. No other entries are made in that block.

1.7.2 When a superseding EO is released, it contains the new information plus the information which was corrected on the superseded EO. The information in the "Reason for and Description of Change" block of the superseding EO is preceded by the note "This EO cancels and supersedes EO ___."

1.7.3 When information on a released EO is to be corrected, the note "This EO corrects EO ____" is entered in the "Reason for and Description of Change" block. The old information is preceded by the statement "Change from". The new information is preceded by the statement "Change to".

1.7.4 The proper revision status of a document which has had a sequence of canceling and superseding EOs released against it includes only the current EO. All prior canceled and/or superseded EOs of the sequence remain canceled and cannot be subsequently reinvoked. When an EO is corrected, both the corrected and the correcting EO are in effect.

2. Block Entries

2.1 Table I provides detailed instructions for completing an Engineering Change during the Engineering Change Request phase of change processing. Table II provides detailed instructions for completing an Engineering Change during EO or RN phase of change processing. Figure 3 shows the flow of the Engineering Change document for a single engineering change.

*A. Napolitano
General Manager, Civil Space Programs

Lee Tessmer
MODIS Program Manager

*** This PI deviates from EP's 1.1, 1.2, 4.4, 4.7 and 4.10**

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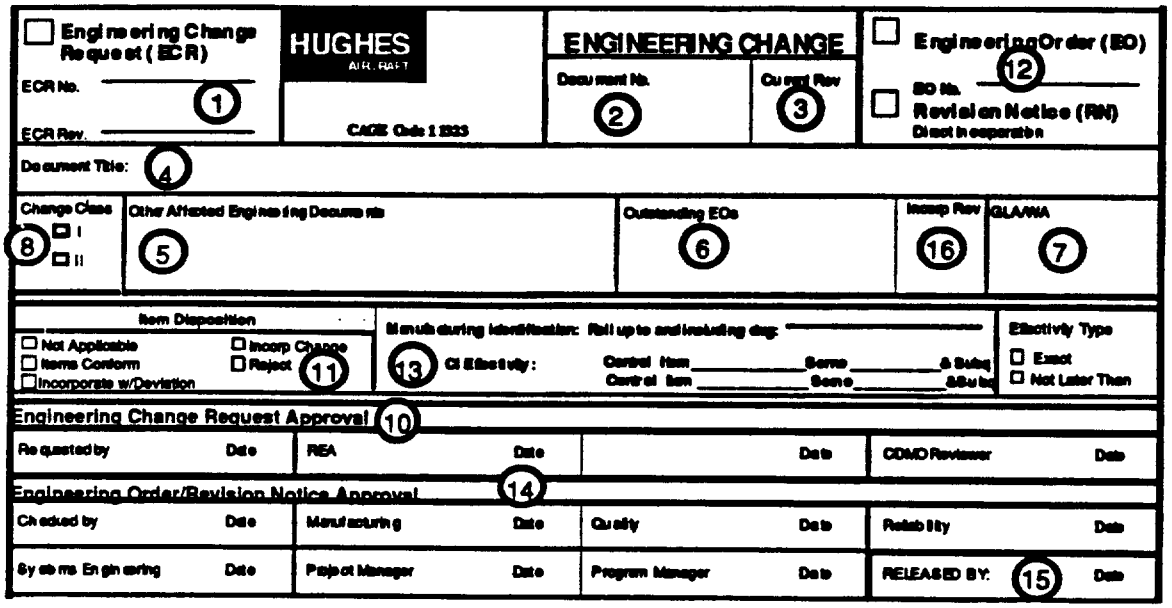
SUBJECT: ENGINEERING CHANGE PROCESS

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.19

PROGRAM/PROJECT NAME: MODIS **REVISION:** —



Reason for and description of change:

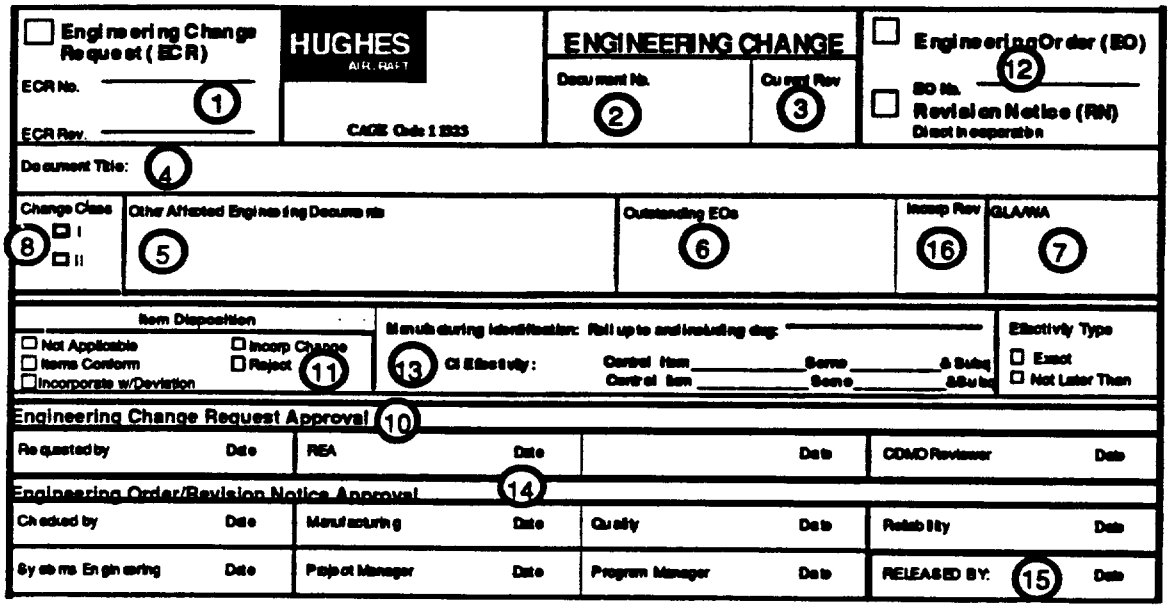
9

Figure 1 Engineering Change

SUBJECT: ENGINEERING CHANGE PROCESS

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.19

PROGRAM/PROJECT NAME: MODIS **REVISION:** —



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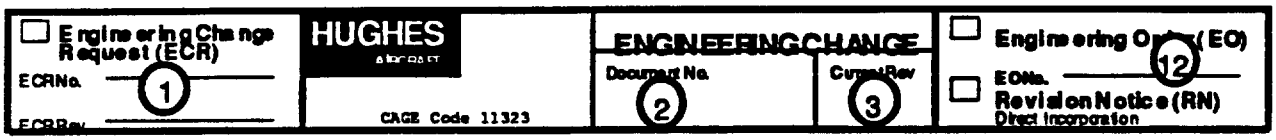
9

Figure 1 Engineering Change



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Sheet ——— of ———

Figure 2 Engineering Change Continuation Sheet

Table I, Engineering Change Request Processing

BLOCK INSTRUCTIONS

(1) Engineering Change Request (ECR) - Enter program unique ECR number assigned by CDMO. Place "X" in check box and enter ECR number as assigned. If ECR is modified after REA approval, enter a two-character alpha-number code to represent the revision. The initial revision is left blank. "R1", "R2", "R3", etc., is entered for each revision thereafter.

NOTE: Update the ECR revision if an REA-approved ECR is modified after it is presented to EDCC to authorize release of the master document.

(2) Document No. - Enter the identifying number as it appears on the affected document.

(3) Current Rev - Enter the current (prior-to-change) revision letter of the affected document. If the prior-to-change revision is "no change," enter a dash (-).

NOTE: This field applies to the current revision during the ECR preparation phase and is also applicable to an EO prior to incorporation.

(4) Document Title - Enter the document title as it appears on the affected document.

(5) Other Affected Engrg Doc - Enter identifying number of other documents which require related changes as a result of this change. If no other documents are affected, enter "NONE."

(6) Outstanding EOs - List all outstanding EOs against the document. If there are no outstanding changes, enter "NONE."

(7) GLA/WA No. - Enter the applicable program General Ledger Account or Work Authorization (WA) number to be charged to incorporate the change.

(8) Change Class - Classify the proposed change as Class I or Class II by checking the appropriate box. Change classification is determined in accordance with contract requirements.

(9) Reason for and Description of Change - See special instructions in Section 2.2.

(10) Engineering Change Request Approval - This block is completed by the Requester, REA, CDMO Reviewer (or IPT designated CM administrator) and other signatories as required by program. Signatories legibly complete this block using first initial, surname, and date.

Table I, Engineering Change Request Processing

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NOTE: This field applies to the current revision during the ECR preparation phase and is also applicable to an EO prior to incorporation.

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(9) Reason for and Description of Change - See special instructions in Section 2.2.

(10) Engineering Change Request Approval - This block is completed by the Requester, REA, CDMO Reviewer (or IPT designated CM administrator) and other signatories as required by program. Signatories legibly complete this block using first initial, surname, and date.

(11) Item Disposition - Enter the item disposition statement by checking the appropriate box. Item dispositions are established in accordance with the SBRS Engineering Procedure, 4.5.

Table II, EO / RN Processing

(12) Engineering Order (EO) - If the change is to be released as an advance change against the affected document, place an "X" in the "Engineering Order" check box and enter the EO number assigned by EDCC or the Program CDMO administrator. If the change is to be prepared as a direct incorporation, place an "X" in the "Revision Notice" check box.

(13) Effectivity and Manufacturing Implementation - Complete this section in accordance with EP 4.5

(14) Engineering Order/Revision Notice Approval - The Change Review Activity authorizes document revision. Signatories legibly complete this block using first initial, surname, and date.

(15) Release - Signature and date by the Release Activity indicate formal release.

(16) Incorporating Rev - When the change is incorporated into the affected document, enter the incorporating revision letter in this block.

2.2 Instructions for Block 11, Reason for and Description of Change

2.2.1 Requirements for Engineering Change Request

During the change request phase, an ECR may be used simply to identify a problem. For this reason, the initial revision of an ECR may contain minimal detail in Block 11.

2.2.2 Requirements for ECR Approval

In order for an ECR to be approved by the REA, it must contain sufficient detail to document the problem and suggest proposed solution.

2.2.3 Requirements for EO/RN Approval

The Change Review Activity authorizes document revision only when the EO/RN records the exact changes to the affected document and includes the "prior-to-change" and "after-change" conditions, as detailed below:

(11) Item Disposition - Enter the item disposition statement by checking the appropriate box. Item dispositions are established in accordance with the SBRS Engineering Procedure, 4.5.

Table II, EO / RN Processing

(12) Engineering Order (EO) - If the change is to be released as an advance change against the affected document, place an "X" in the "Engineering Order" check box and enter the EO number assigned by EDCC or the Program CDMO administrator. If the change is to be prepared as a direct incorporation, place an "X" in the "Revision Notice" check box.

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The Change Review Activity authorizes document revision only when the EO/RN records the exact changes to the affected document and includes the "prior-to-change" and "after-change" conditions, as detailed below:

a. Each individual change on a single EO/RN is numbered in series by a number in parentheses, i.e., (1), (2).

b. The parenthetical number is followed by a descriptive statement of the reason for change.

c. The prior-to-change condition is depicted, preceded by the statement "Change from".

d. The after-change condition is depicted, preceded by the statement "Change to".

e. The terms "Added", "Deleted", and Removed" may be used in accordance with the Hughes Drafting Room Manual.

2.2.4 Revision of Documents

In order to eliminate multi-sheet RNs for changes made to documents, a single sheet RN may be used. In addition to the reason for change, the contents of this sheet should have descriptive information on it similar to the following:

FOR PRIOR-TO-CHANGE CONDITION SEE PREVIOUS REVISION
RETAINED IN EDCC. THIS IS AVAILABLE ON REQUEST.

Marginal bars may be used to indicate changed paragraph in "A-size" or bookform documents.

a. Each individual change on a single EO/RN is numbered in series by a number in parentheses, i.e., (1), (2).

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SUBJECT: ENGINEERING CHANGE PROCESS

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.19

PROGRAM/PROJECT NAME: MODIS **REVISION:**—

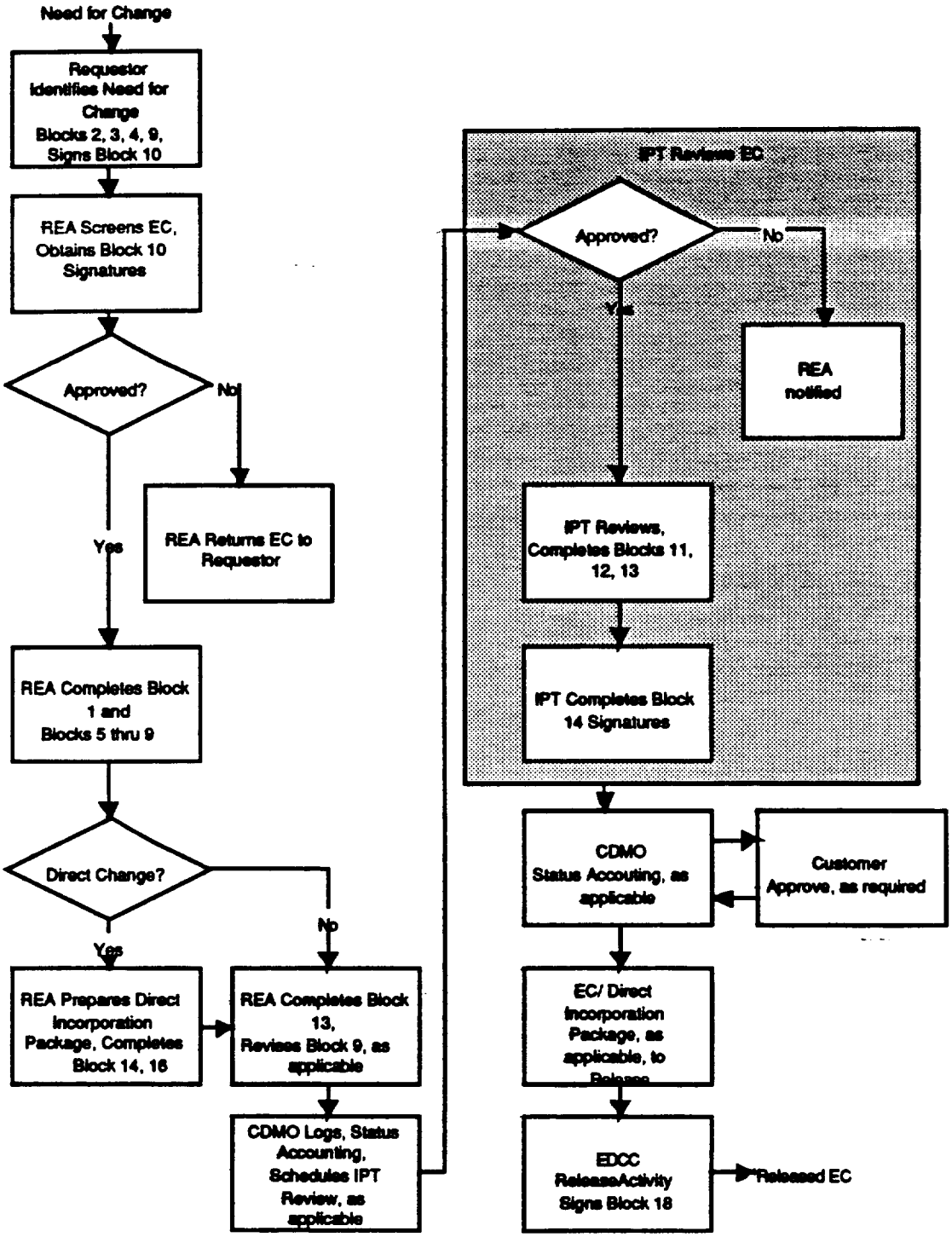
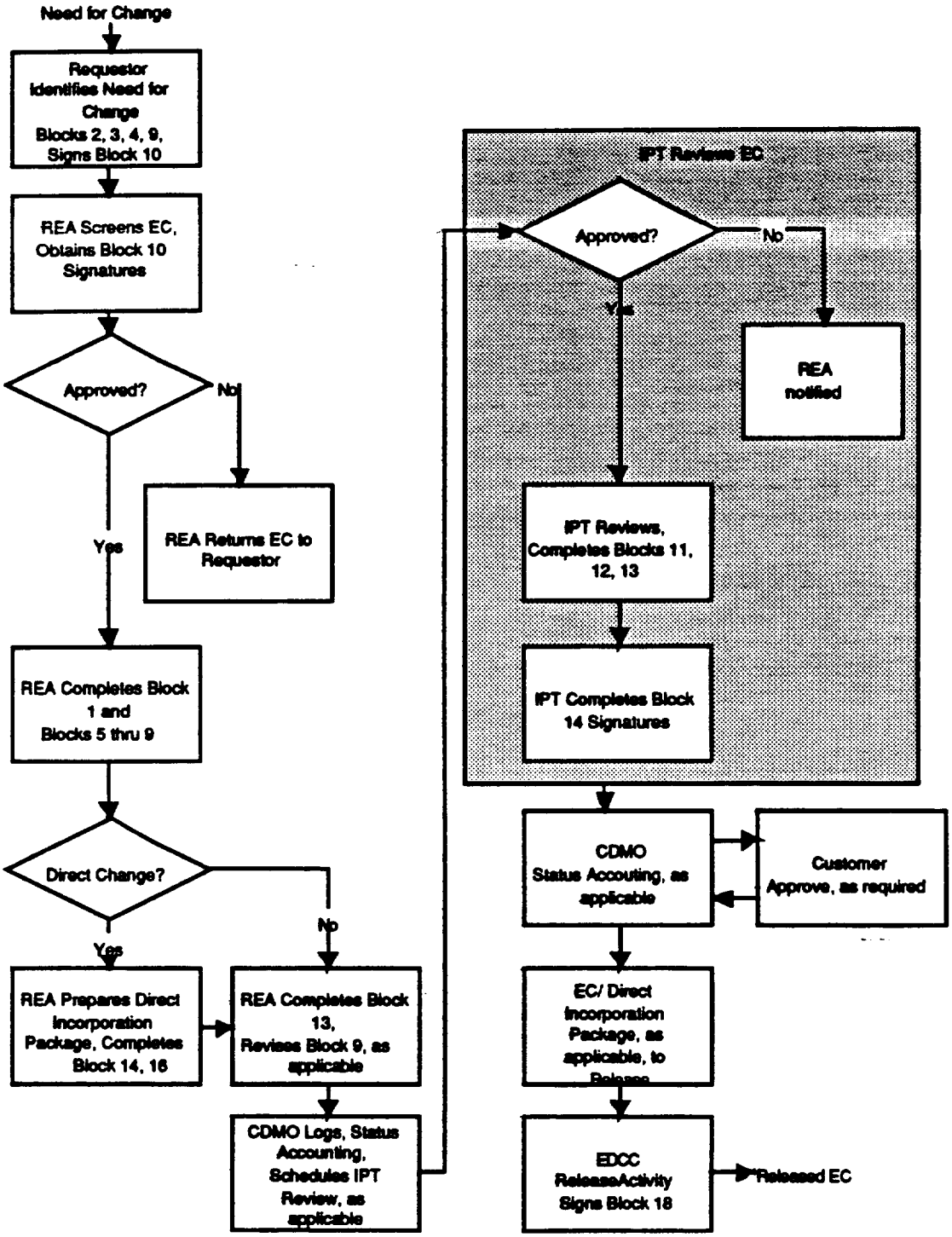


Figure 3: Engineering Change Form Flow

SUBJECT: ENGINEERING CHANGE PROCESS

PROGRAM/PROJECT LOG NUMBER: PL-3095 **FILE NUMBER:** 7.19

PROGRAM/PROJECT NAME: MODIS **REVISION:**—



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